

they differ from one another in their degrees of intelligence; and his observations, though of course not conclusive, are interesting and suggestive.

If again we examine the hind legs of bees, we shall find similar gradations. In *Prosopis* (Fig. 32) they do not differ materially from those of genera which supply their young with animal food. Portions of the leg, indeed, bear stiff hairs, the original use of which probably was to clean this burrowing insect from particles of sand and earth, but which in *Prosopis* assist also in the collection of pollen.

Fig. 33 represents the hind leg of *Sphecodes* (Fig. 34), a genus in which the tongue resembles in form that of *Halictus*. Here we see the hairs decidedly more developed, a modification which has advanced still further in *Halictus* (Fig. 35), in which we see that the development of the hairs is most marked on those segments of the hind legs which are most conveniently situated for the collection and transport of pollen.

In *Panurgus* the same change is still more marked, and the pollen-bearing apparatus is confined to the tibia and first segment of the tarsus, a differentiation which is even more apparent in *Anthophora*. In these bees the pollen is simply entangled in the hairs of the leg as in a brush, but there are other genera, as for instance the humble bees and the hive bee, which moisten the pollen with honey, and thus form it into a sticky mass, which is much more easy to carry, and is borne, not round the leg, but on one side of it. In the humble bee (*Bombus*, Fig. 36), for instance, the honey is borne on the outer side of the hinder tibiae, which are flattened, smoothed, and bordered by a row of stiff curved hairs, which thus constitute it a sort of little basket. Lastly, in the hive bee (Fig. 37), the adaptation is still more complete, the hairs on the first tarsal segment are no longer scattered, but are arranged in regular rows; and the tibial spurs inherited by *Bombus* from far-distant ancestors have entirely disappeared.

In some bees the pollen is collected on the body, and here also we find a remarkable gradation from *Prosopis*, which has only minute and simple hairs, like a wasp; through *Sphecodes*, a *Nomada*, in which the longer hairs are still few, and generally simple, though some few are feathered; to *Andrena* and *Halictus*, where the hairs are much more developed; a change which is more marked in *Sarapoda*, *Colletes*, and *Megachile*; still more so in *Osmia* and *Anthophora*; until we come to the humble bees, in which the whole body is covered with long feathered hairs.

Although flowers present us with all these beautiful and complex contrivances, whereby the transfer of pollen from flower to flower is provided for and waste is prevented, yet they are imperfect, or at least not yet perfect, in their adaptations. Many small insects obtain access to flowers and rob them of their contents. *Meloe rotundifolia* can be, and often is, sucked by bees from the outside, in which case the flower derives no advantage from the visit of the insect. In *Medicago sativa*, also, insects can suck the honey without effecting fertilisation, and the same flower continues to secrete honey after fertilisation has taken place, and when apparently it can no longer be of any use. Fritz Müller has observed that, though *Posoqueria fragrans* is exclusively fertilised by night-flying insects, many of the flowers open in the day, and consequently remain sterile.

It is of course possible that these cases may be explained away; nevertheless, as both insects and flowers are continually altering in their structure and in their geographical distribution, we should necessarily expect to find such instances. Animals and plants constantly tend to adapt themselves to their conditions, just as water tends to find its own level.

I have been good-humouredly accused of attacking the little busy bee, because I have attempted to show that it does not possess all the high qualities which have been popularly and poetically ascribed to it. But if scientific observations do not altogether support this intellectual eminence, which has been ascribed to bees, they have made known to us in the economy of the hive many curious peculiarities which no poet had ever dreamt of, and have shown that bees and other insects have an importance as regards flowers which had been previously unsuspected. To them we owe the beauties of our gardens, the sweetness of our fields. To them flowers are indebted for their scent and colour, nay, their very existence in its present form. Not only have the brilliant colours, the sweet scent, and the honey of flowers been gradually developed by the unconscious selection of insects, but the very arrangement of the colours; the circular bands and radiating lines, the form, size, and position of the petals, the arrangement of the stamens and pistil, are all arranged with reference to the visits of insects, and in such a

manner as to ensure the grand object which renders these visits necessary.

Thus, then, I have attempted to point out some of the relations which exist between insects and our common wild flowers; the whole subject is one, however, which will repay most careful attention, for, as Müller has truly said, there is no single species the whole history of which is yet by any means thoroughly known to us, and while, with reference to the regions of thought brought before us by the president on Wednesday evening, few can hope themselves to assist in the progress of truth, the case is very different with reference to my subject of this evening, in which every one of us by care and perseverance may fairly hope to add something to the sum of human knowledge.

## NOTES

WE hear that it is most probable that Dr. T. Lauder Brunton, F.R.S., whose investigations in the science of therapeutics have made him so well known to physiologists and pathologists generally, will undertake the editorship of the *Practitioner*, rendered vacant by the death of Dr. Anstie.

THE forty-seventh congress of German naturalists and physicists opened at Breslau on Sept. 18. The proceedings were opened by the eminent chemist, Prof. Loewig, who expressed his satisfaction at seeing so many foreigners, whose presence in that assembly, he added, was a living testimony to the truth that science was of no country. Capt. von Dechen read a paper upon the present state and the future prospects of geology. After him, Prof. Virchow, of Berlin, spoke upon miracles regarded from the scientific standpoint. The several sections were then constituted, and the members of the congress afterwards adjourned to a banquet. In the evening an open-air entertainment was given by the city, and a telegraphic greeting was sent to the Emperor.

THE fortieth congress of the French Institute of the Provinces, *Les Mondes* informs us, opened at Rodez on Monday last, under the presidency of M. de Toulouse-Lautrec, and will last ten days. There are five sections, in which questions are discussed connected with the mathematical, physical, and natural sciences, agriculture, industry and commerce, anthropology and the medical sciences, history and archaeology, philosophy, literature, the fine arts, and social economy. This is certainly comprehensive enough.

THE last expedition for observing the transit of Venus is now on the point of leaving England for Egypt. It has developed into one of considerably greater magnitude than was at first intended. The Government expedition organised by Sir George Airy, instead of being located at Alexandria, will have its headquarters at Cairo, the longitude of which city is to be found by exchange of telegraph signals with Greenwich, for which purpose a branch station will be established for a time at Alexandria. For the actual observation of the transit, Cairo, Thebes, and Suez are selected, the longitude of the last two being obtained by exchanging telegraph signals with Cairo. The photographic branch of the enterprise will probably be at Thebes. Private expeditions have been organised, all of them in concert with the English Government one. The whole may be enumerated as follows:—English Government Expedition.—Chief captain, C. Orde Browne; photographic branch, Capt. Abney; astronomers, Mr. S. Hunter and Mr. Newton. Prof. Döllén, the Russian astronomer, and Col. Campbell have organised private expeditions to Thebes. Dr. Anvers proposes to be either at Cairo or Thebes, and Admiral Ommanney may also join the English party as an associate astronomer. The whole of the telescopes and huts from Greenwich are now on board the Peninsular and Oriental vessel *Hindustan*, which is to leave Southampton on the 1st proximo.

MR. LOUIS SEEBOHM, one of the chief photographers who embarked on the *Svatara* in June last as a member of the American Transit of Venus expedition, died at Bahia on July 22. He had been extremely ill during the voyage, and was ordered home by the medical officer of the vessel, but died of fever before he could be removed.

THE October number of Petermann's *Mittheilungen* will contain a valuable paper by Prof. H. Fritz on the geographical extension of the Aurora Borealis; the accompanying map, which contains the magnetic meridians, shows by a system of curves the places on the earth's surface from which the light is seen with equal frequency. Also a fine map of Haiti on the scale of 1:100,000, with accompanying description; and the continuation of Dr. Nachtigal's contribution on the tributaries of the kingdom of Baghirmi, in which he gives some account of the fauna and flora of the region and of the manners, customs, and condition of the people. There is also a paper translated from the Russian of L. Kostenko, giving a personal account of the country between Khiva and Fort Kasala on the Sir-Daria.

A MOVEMENT is on foot among the students of the University of St. Andrews with the object of electing Mr. Darwin to the Rectorial chair in the room of Lord Neaves, who retires in November. On the last occasion a large number of the students were favourable to the election of a scientific man in the person of Prof. Huxley, and as he lost his election by only three votes, the Darwinians are encouraged to prosecute the candidature of their nominee. The election will take place on the fourth Thursday of November.

THE *Daily News* of Saturday last has a letter, dated Kandavan, Aug. 8, from its correspondent with the *Challenger*, giving an account of a short cruise from Wellington, New Zealand, which was left on July 6, to the Fiji Islands. The trawling and dredging was very successful, and many zoological and botanical specimens have been obtained. Among the treasures obtained by the trawl was a live nautilus, the only one caught alive since the ship left England. The *Challenger* was to proceed to the New Hebrides and Torres Straits, where it was expected to arrive about the beginning of this month.

M. CORENWINDER has contributed to a recent meeting of the Société des Sciences de Lille an exhaustive series of observations on the processes of respiration and nutrition in plants. He supports M. Claude Bernard's view, that the process ordinarily known as the respiration of plants—the decomposition of the carbonic acid of the atmosphere—is really a process of digestion, and that simultaneously with this, plants carry on, by day as well as by night, a true process of respiration, similar in all respects to that performed by animals, consisting in an oxidation of the carbonaceous matters of their tissues. By a very careful series of analyses, performed mainly on the lilac and maple, M. Corenwinder determined that the proportion of nitrogenous matter in the leaves gradually and progressively diminishes from the time that they emerge from the bud till their fall; the proportion of carbonaceous matter increases very rapidly during April and May, and then remains nearly stationary till October; while that of incombustible substance increases during the whole period of vegetation. He distinguishes, therefore, two periods in the vegetative season of the plant—the first period, when nitrogenous constituents predominate, is that during which respiration is the most active; the second, when the proportion of carbonaceous substance is relatively larger, is the period when respiration is comparatively feeble, the carbonic acid evolved being again almost entirely taken up by the chlorophyll, decomposed, and the carbon fixed in the true process of digestion.

PROF. H. HOFFMANN of Giessen has made some interesting experiments on the permanence of varietal and specific characters

in the case of the French Bean and Scarlet Runner (*Phaseolus vulgaris* and *multiflorus*). A very large number of attempts to fix special varieties which were casually produced invariably failed, the tendency towards reversion to the ancestral form being apparently irresistible. On the other hand, no one of the characters which are ordinarily relied on to distinguish the two species from one another is constant, but is liable, under certain circumstances, to disappear. Dr. Hoffmann has also made a similar series of experiments on the Common Red Poppy (*Papaver Rhæas*). Constant cultivation for six years produced no perceptible variation; but in the seventh year several varieties in the colour, and in the next year in the form of the petals, made their appearance, tending towards an assimilation to *P. dubium*.

THE *Gardener's Chronicle* announces a new material for paper in a well-known American grass, *Zizania aquatica*. It is stated that the *Zizania* yields fully as much of the raw material as esparto, and has the great and peculiar merit of being comparatively free from silicates. Paper made from it is quite as strong and quite as flexible as that made from rags; it is easily bleached, economical in respect of chemicals, pure in colour, and remarkably free from specks and blemishes. It is especially recommended for the manufacture of printing paper. The grass grows in enormous quantities in our Canadian Dominion, on the shores of Lakes Erie, St. Clair, Ontario, &c., and it is affirmed that a supply of 100,000 tons annually may be looked on as certain. Its habitat is swamps, ponds, and shallow streams, where it grows to a height of from 7 to 8, or even to 12 and 14 ft. The structure is similar to that of rice, except that the flowers are unisexual. The grains are largely used as an article of food by the native Indians, some tribes depending on them to a large extent for their subsistence. The flavour is said to be superior to that of most other cereals, and it has long been known from these properties as "Canada Rice."

THE will of the late Girolamo Ponti, of Milan, which has just been published in the *London Gazette* by order of Lord Derby, is likely to give rise to some trouble before it can be carried into effect. The testator has bequeathed a considerable portion of his property to the "Academies of Science of London, Paris, and Vienna," to be divided among them in equal proportions, for the purpose in each case of founding, with the proceeds resulting from investment, two competitions yearly on the subjects of Mechanics, Agriculture, Physics and Chemistry, Travels by Sea and Land, and Literature. The committees to be appointed by the societies are instructed to give preference to those competitors who will have advanced any of the subjects mentioned by original discovery. The relatives of Signor Ponti are to dispute the will, and those London societies that think they have claims upon the legacy are urged to bring them forward at once. There can be no doubt which societies are meant in the case of Paris and Vienna; and at first sight there appears to be little doubt as to what body the title of "Academy of Science of London" would most appropriately apply.

AT the meeting of the Paris Academy of Sciences held Sept. 14, Dr. A. W. Hofmann announced that his two students, MM. Tiemann and Haarmann, who had obtained vanilline (the aromatic principle of the vanilla bean) from pine sap, propose to manufacture this substance on a large scale. The sap of a tree of medium height gives vanilline to the value of 100 fr., and the wood is not injured by the extraction of the sap. This will be the second vegetable product manufactured by purely chemical methods.

THE first fungus exhibition held in Scotland was opened in Aberdeen on Friday. The idea of the exhibition was first suggested by the Rev. Mr. Ferguson, of New Pittligo, in the *Scottish Naturalist* for April. The suggestion was readily taken up by fungologists and men of science, and the result was an exhibition



which those entitled to speak with authority say was never equalled in this country. The specimens numbered about 7,000. Almost every county in Scotland made large contributions, while England and Wales sent a number of exhibits. In fact, almost every fungologist in Britain contributed specimens.

IN an address on Education at Rochdale on Saturday, Mr. Jacob Bright urged the claims of Owens College, Manchester, to assistance from the national exchequer; and hinted that a time was approaching when the enormous revenues of Oxford and Cambridge would be made more productive to the country.

THE members of the *Tegethof* Austrian Polar Expedition have arrived at Hamburg. They everywhere in Norway met with a very cordial welcome. The new country, as far as explored, comprises five islands, and contains hares and foxes. When rescued, the members of the expedition were in rags, and for a fortnight had been short of provisions and of firing. They were compelled to shoot all the sledge dogs, as the animals showed signs of madness. The members of the expedition will, it is expected, reach Vienna to-morrow.

A NOTICE has been issued from the Science and Art Department that the Classes in Chemistry (Prof. Frankland), Biology (Prof. Huxley), Physics (Prof. F. Guthrie), and Applied Mechanics (Prof. Goodeve), have been transferred to the new buildings, South Kensington, where they will open in the beginning of October.

MR. ANDREW MURRAY writes to the *Gardener's Chronicle* that he has, within the last few weeks, made some observations at the Ochil Hills, Kinross-shire, on *Pinguicula* and *Drosera*, with reference to the fly-digesting powers they are asserted to possess. He states that he found the leaves of *Pinguicula* close, quite independently of the fact of a fly being in them or not. "The leaves are found with their margins in all stages of curling over, some with no insect on them much more curled over than others with several." The secretion which Dr. Hooker states kills a captured insect he finds is glutinous, and he believes it does not fall on to the insect, but that death results from the secretion adhering to and closing up the spiracles by which the insect breathes. With regard to *Dionaea*, he suggests that it should be carefully noted (1) whether the secretion is never present until after an insect has been captured; (2) whether it is always present after one has.

AMONG the recent additions to the Manchester Aquarium is fine specimen of the Monk or Angel Fish, between five or six feet in length, and weighing at least one hundred pounds. With the exception of an example of very similar dimensions brought to the Brighton tanks about a year ago, but since dead, it is one of the largest yet recorded as taken on the British coasts. This specimen was captured at Colwyn Bay, near Conway, and is still in the most healthy and perfect condition. A number of young herring, of which fish the Manchester Aquarium now possesses many hundreds, were consigned last week by the curator, Mr. W. Saville-Kent, to the aquarium at the Crystal Palace; most of these arrived in safety, and are of especial interest as being the first of the species successfully introduced at that institution.

THE additions to the Zoological Society's Gardens during the past week include a Chimpanzee (*Troglodytes niger*); a Bay Antelope (*Cephalophus dorsalis*), and three Royal Pythons (*Python regius*), from West Africa, presented by Mr. C. B. Mosse; a King Vulture (*Gyparchus papa*) from South America, presented by Mr. G. I. Brumschweiler; a Grey Ichneumon (*Herpestes griscus*) from India, presented by Capt. Hallett; two Little Bitterns (*Ardeetta minuta*), European, presented by Mr. A. A. van Bemmelen; an Alligator (*Alligator mississippiensis*) from Demerara, presented by Capt. Turner; a Yellow-fronted Amazon (*Chrysotis ochrocephala*) from Guiana, deposited.

## MARITIME CONFERENCE

THE conclusions come to by the recent Conference on Maritime Meteorology have been forwarded to us with the following letter:—

"Sir,—I have the honour to inform you that the Permanent Committee of the International Meteorological Congress at Vienna (1873), at whose suggestion the recent Conference for Maritime Meteorology was held in London, has resolved to forward the Resolutions adopted at that Conference for publication at once, thus anticipating the publication of the full Official Report of the Conference. The Permanent Committee will feel deeply obliged if you can find space for them.

"ROBERT H. SCOTT,  
"Secretary to the Permanent Committee."

Resolved—"That there should be but one form of Meteorological Register for the Navies and Merchant Services, and that those who cannot fill the log should keep part of it."

### Questions.

#### I.—OBSERVATIONS—

Columns 1 to 6.—*Date and Position of the Observations.*

Is it your opinion that a fresh column should be added headed "Course and distance by the log in every watch of four hours?"

That an additional column should be given in the log for "Course and distance."

That the course should be expressed in degrees, and not in points.

That the question of hours, 4-hourly periods, as proposed by Captain Toynbee, should be adopted.

Columns 7 and 8.—*Currents.*

That observations on the "direction and rate" of currents be transferred to the column for Remarks.

Column 9.—*Magnetic Variation.*

Is it desirable to give an additional column for the "Direction of ship's head?"

That an additional column be given in the log for the direction of the ship's head, and the amount of heel to port or star-board.

That the total compass-error and not variation only be given.

That the Conference expresses its opinion that the lettering on the English compass should be adopted by all nations for meteorological purposes.

Columns 10 and 11.—*Wind Direction and Force.*

Is it possible to employ an anemometer at sea, so as to give trustworthy results?

That a decided answer to this question cannot at present be given, but it is desirable that various anemometers should be tested by special ships, and that a special form of four extra columns should be prepared for the purpose of recording such observations.

Can the use of the Beaufort scale be made universal?

That the use of the Beaufort scale should be continued, with the addition of the amount of sail which Beaufort's ship would have carried had she been rigged with double topsails. Also that the direction and force of the wind should be recorded at the time of observation, and not estimated for a certain number of previous hours. Also, that they should be recorded every two hours.

Columns 12 and 13.—*Barometer.*

To what degree of minuteness is it necessary to observe at sea, or its equivalent in the metric scale.

\* The numbers of the columns refer to the Brussels Abstract log.